National Institute of Environmental Health Sciences

# Climate change - An uncertainty factor in risk analysis of contaminated land

**Author(s):** Augustsson A, Filipsson M, Oberg T, Bergback B
**Year:** 2011
**Journal:** The Science of The Total Environment. 409 (22): 4693-4700

**Abstract:**

Metals frequently occur at contaminated sites, where their potential toxicity and persistence require risk assessments that consider possible long-term changes. Changes in climate are likely to affect the speciation, mobility, and risks associated with metals. This paper provides an example of how the climate effect can be inserted in a commonly used exposure model, and how the exposure then changes compared to present conditions. The comparison was made for cadmium (Cd) exposure to 4-year-old children at a highly contaminated iron and steel works site in southeastern Sweden. Both deterministic and probabilistic approaches (through probability bounds analysis, PBA) were used in the exposure assessment. Potential climate-sensitive variables were determined by a literature review. Although only six of the total 39 model variables were assumed to be sensitive to a change in climate (groundwater infiltration, hydraulic conductivity, soil moisture, soil:water distribution, and two bioconcentration factors), the total exposure was clearly affected. For example, by altering the climate-sensitive variables in the order of 15% to 20%, the deterministic estimate of exposure increased by 27%. Similarly, the PBA estimate of the reasonable maximum exposure (RME, defined as the upper bound of the 95th percentile) increased by almost 20%. This means that sites where the exposure in present conditions is determined to be slightly below guideline values may in the future exceed these guidelines, and risk management decisions could thus be affected. The PBA, however, showed that there is also a possibility of lower exposure levels, which means that the changes assumed for the climate-sensitive variables increase the total uncertainty in the probabilistic calculations. This highlights the importance of considering climate as a factor in the characterization of input data to exposure assessments at contaminated sites. The variable with the strongest influence on the result was the soil:water distribution coefficient (Kd).

**Source:** http://dx.doi.org/10.1016/j.scitotenv.2011.07.051

## Resource Description

**Exposure :** ☑

weather or climate related pathway by which climate change affects health

Food/Water Quality, Other Exposure

**Food/Water Quality:** Chemical

**Geographic Feature:** ☑

resource focuses on specific type of geography

None or Unspecified

**Geographic Location:** ☑

resource focuses on specific location

Global or Unspecified

**Health Impact:** ☑

specification of health effect or disease related to climate change exposure

Cancer, Morbidity/Mortality, Urologic Effect, Other Health Impact

**Other Health Impact:** Bone damage

**Mitigation/Adaptation:** ☑

mitigation or adaptation strategy is a focus of resource

Mitigation

**Model/Methodology:** ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

**Population of Concern:** A focus of content

**Resource Type:** ☑

format or standard characteristic of resource

Research Article

**Timescale:** ☑

time period studied

Long-Term (>50 years)

**Vulnerability/Impact Assessment:** ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content